



WATER BUREAU POLICY AND PROCEDURES

NUMBER:	WB-012	
SUBJECT:	DISPOSAL OF BACKWASH WATER FROM ARSENIC REMOVAL UNITS	
EFFECTIVE DATE:	OCTOBER 12, 2007	PAGE: 1 OF 5
REVISION DATE:	(5-YEAR REVIEW FREQUENCY)	

ISSUE:

All community water supplies and nontransient noncommunity water supplies must comply with the arsenic maximum contaminant level (MCL) of 0.010 milligrams per liter, or 10 parts per billion. In order to meet the arsenic MCL, many water systems will have to install treatment and most, if not all, arsenic treatment systems have to be periodically backwashed. Disposal options of the backwash water include pumping to an existing sanitary sewer line, surface water discharge, or groundwater discharge.

AUTHORITY:

R 325.10601 and R 325.10604c of the Administrative Rules adopted under the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), being MCL 325.1001 *et seq.*, covering drinking water standards for specific contaminants, including arsenic and other inorganics, that shall be met by a supplier of water to assure the protection of public health. In addition, Section 325.1004 (2) of Act 399 states, "Upon receipt of the plans and specifications for a proposed waterworks system, the department shall evaluate the adequacy of the proposed system to protect the public health by supplying water meeting the state drinking water standards."

The Part 21, Part 22 and Part 23 Rules of Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

DEFINITIONS:

Community Water Supply (CWS) – A public water supply that provides year-round service to not fewer than 15 living units, or that regularly provides year-round service to not fewer than 25 residents. Examples include municipalities, such as cities, villages, and townships; apartment complexes; manufactured housing communities; condominiums; and nursing homes.

Nontransient Noncommunity Water Supply (NTNCWS) – A noncommunity supply that serves not fewer than 25 of the same individuals on an average daily basis more than six months of the year. Examples include places of employment, schools, and day care centers.

POLICY:

CWS and NTNCWS have several treatment options to remove arsenic from drinking water, including conventional iron removal, modified iron removal, anion exchange and adsorptive medias. Each of these treatment processes will produce an arsenic residual. The amount of residual produced and the concentration of arsenic in the residual will depend upon a variety of factors, including raw water quality, type of treatment, frequency of backwashing or regeneration, and chemicals used in the treatment process.

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EFFECTIVE DATE: OCTOBER 12, 2007

PAGE: 2 of 5

REVISION DATE:

This policy provides a description for Water Bureau staff of how to evaluate discharge options for backwash water. Those options include discharge to a municipal sewer, a National Pollutant Discharge Elimination System (NPDES) surface water discharge permit or a groundwater discharge permit.

Summary of Arsenic Removal Technologies

Conventional and modified iron removal processes - oxidation and filtration are used to remove both iron and arsenic from the water. Oxidation (aeration, chlorine, potassium permanganate) converts iron in the raw water to iron hydroxides. If arsenic is present, the oxidized form, arsenate [As(V)], is adsorbed onto the iron hydroxide precipitates and removed by filtration. The filters are periodically backwashed to remove the iron/arsenic particulates. If arsenic is in the raw water source, the backwash water usually contains arsenic concentrations above background levels.

Adsorption medias - remove arsenic by passing water under pressure through filter beds packed with the media and the As(V) in the raw water is adsorbed onto the media. When all the adsorption sites have been used up or exhausted, the media can be either regenerated or replaced. If any iron/arsenate precipitates are formed, arsenic will be removed by filtration, not adsorption. Since most groundwaters in Michigan contain some levels of iron, many adsorption filters will remove arsenic by both filtration and adsorption. These medias are usually backwashed every three-five weeks, not to remove the arsenic that has been adsorbed, but to uncompact the media and to remove any suspended solids that may have accumulated within the filter. The arsenic concentrations in the backwash water are usually at or below background levels, but can be higher if iron/arsenate particulates are present.

Ion exchange - is a physical-chemical process in which ions are exchanged between a solution phase and a solid resin phase. As(V) is removed through the use of anion exchange resin. Once the resin has been used to exhaustion, it can be regenerated on-site with brine. Single pass regeneration usually produces 40–50 bed volumes of brine waste. Due to the large volumes of regenerate water and concerns with high chloride and sodium concentrations in the waste stream, discharges to the groundwater from ion-exchange units are not eligible for a groundwater discharge permit exemption.

Arsenic Backwash Disposal Options

Connection to an existing sanitary sewer that flows to a wastewater treatment facility

The primary choice for discharge of water treatment backwash should be into a sanitary sewer system. Discharge to the sanitary sewer should be approved by the local wastewater treatment system owner prior to connection. If the system can handle the arsenic loading and not cause the wastewater treatment facility to violate its NPDES or state permit, no further assessment is necessary. The sanitary sewer must be evaluated to determine if it is able to accept the full flow of the disposal stream. If there is a mass loading concern, it may be necessary to install holding facilities to “bleed” the residual into the system. This may be accomplished by installing a tank or basin to hold at least a full backwash volume and then bleed in at a rate the sewer and waste facility can handle. The waste facility will be handling the same total arsenic loading over a long period as it receives now without any drinking water treatment. It is a mass balance issue that must be

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EFFECTIVE DATE: OCTOBER 12, 2007

PAGE: 3 of 5

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addressed through the Industrial Pretreatment Program (IPP), if applicable. Changes to the IPP may take several months to complete. The project construction and IPP changes can be done simultaneously. The water plant will be expected to comply with local requirements when the discharge commences.

Discharge to a surface water

If a sanitary sewer is not available for discharge of the backwash water, the second preferred method for discharge is to a surface water body, which will require an NPDES permit. A general NPDES permit, wastewater discharge from potable water supply will usually provide coverage for this type of discharge. NPDES permits have limitations and requirements, which will be stated on the permit. Information on how to apply for an NPDES permit can be obtained at the DEQ website, http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3713-10440--,00.html.

Discharge to Groundwater

If neither a sanitary sewer nor surface water body is available for discharge, a groundwater discharge should be considered the method of last resort. R 323.2210 of the Part 22 Rules describes what discharges are allowed without obtaining an individual or general permit. Rule 2210(o) states that the discharge of water treatment filter backwash water is exempt from a groundwater discharge permit if disposal is in accordance with plans and specifications approved by the department under Act 399.

Criteria to qualify for Groundwater Discharge Permit Exemption

Backwash water from iron removal plants has historically been granted an exemption pursuant to R 323.2210(o). If arsenic is in the backwash water from an iron removal or adsorption processes, it will be in the form of iron/arsenate precipitates. The iron/arsenate bond is very strong and unless a reducing condition occurs, the arsenic will remain bonded to the iron and should not infiltrate back into the groundwater.

Since arsenic treatment units will be permitted under Act 399, backwash water from these units may qualify for an exemption. To be eligible for an exemption, the WB staff must approve, pursuant to Act 399, documentation provided by the applicant that one of the following conditions will be met:

1. The effluent will meet 201 residential clean up standards (10 ppb for arsenic) or background arsenic levels in the receiving groundwater, not the source groundwater, whichever is greater.
2. The seepage bed or infiltration area will remain aerobic due to permeable soils and sufficient surface area, thus precluding infiltration of arsenic into groundwater.

Monitoring well(s) may be required to be installed if it is determined by DEQ that arsenic could potentially be leaching into the groundwater.

In order to reduce the amount of arsenic going to a seepage bed, an intermediate holding tank can be installed. This will allow the iron/arsenate precipitates to settle in the tank and the decant water can be forwarded to the seepage bed. This arrangement will decrease the amount of arsenic being discharged to the seepage bed, but will require the holding tank to be pumped out by a licensed industrial waste hauler and the settled material to be properly disposed.

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EFFECTIVE DATE: OCTOBER 12, 2007

PAGE: 4 of 5

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If a Water Bureau (WB) staff evaluation pursuant to Act 399 determines that neither Item No. 1 nor No. 2 can be met, a Groundwater Discharge Permit will be required.

Discharge to on-site wastewater systems

Discharges of water filtration backwash may occur to subsurface septic tank, tile field systems. The volume, frequency and timing of the discharge, and hydraulic impact on the system should be assessed. The WB staff would also have to follow the same evaluation process as described above for the seepage bed option to determine if the discharger qualified for a Part 22 groundwater discharge permit exemption pursuant to R 323.2210(o) or needed an individual Part 22 permit for the backwash water discharged. In order to discharge to a subsurface system, the discharger must install a holding tank dedicated exclusively to filter backwash water.

The Part 22 Rules [R 323.2210(a)] exempt discharges of sanitary sewage that is not mixed with other waste through septic tank/tile field systems, at volumes less than 6,000 gallons per day (gpd). Water filtration backwash water does not meet the Part 22 definition of sanitary wastewater. Mixing the two waste streams in a single septic tank would eliminate the exemption pursuant to R 323.2210(o) for the sanitary wastewater, and a Part 22 permit would be required if the two waste streams are mixed. However, the WB will allow the discharge of the two waste types from separate tanks to the same tile field if the following conditions are met:

1. The discharger must provide documentation that they have notified the local health department that has jurisdiction for approving their subsurface wastewater disposal system according to the "Michigan Criteria for Subsurface Sewage Disposal."
2. The discharge from the backwash holding tank shall not compromise the capacity of the tile field.
3. Discharge to the tile field from the backwash holding tank should be during off hours, when the likelihood of a sanitary discharge to the tile field is minimal.
4. The total discharge to the shared drain field cannot exceed 6,000 gpd.

REFERENCES:

Michigan Safe Drinking Water Act, 1976 PA 399, as amended, being MCL 325.1001 *et seq.*, and the administrative rules promulgated thereunder, being R 325.10101 *et seq.*

Part 22 Groundwater Quality Rules of Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

United States Environmental Protection Agency (2003), *Arsenic Treatment Technology Evaluation Handbook for Small Systems*, EPA 816-R-03-014, July 2003.

REFERENCE TO BUREAU PROGRAMS:

This policy applies to the Public Water System Supervision and Groundwater Discharge Permit Program.

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PAGE: 5 of 5

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METHOD OF DISTRIBUTION:

The policy will be distributed via e-mail to staff assigned to the community water supply and groundwater discharge programs and located with the other WB policies on the WB common drive.

PROCEDURE:

<u>Responsibility</u>		<u>Action</u>
District Staff	1.	Incorporate this policy as part of the permit process to construct arsenic treatment systems including the disposal of backwash water from arsenic removal units.
District Staff	2.	Review arsenic backwash water discharge proposals and determine if the method of disposal meets the specific criteria for that method listed within the policy.
District Staff	3.	Inform the district supervisor of any discharges that require either a groundwater or surface water permit.
District Supervisors and Assistant District Supervisors	4.	Assist district staff in all matters pertaining to the disposal of arsenic backwash waters. Contact applicant in writing, with a copy to permit staff, that either a groundwater or surface water permit is required, and that they should contact the appropriate permit authority to begin the permit process.

APPROVED: _____

Richard A. Powers
Richard A. Powers, Chief
Water Bureau

DATE: 10/11/07

LAST REVIEWED BY: _____

Name
Title

DATE: _____

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